

## **“MATERIAL IMMERSION APPARATUS”**

### **TECHNICAL FIELD**

The present invention relates to apparatus, methods, uses and products capable of providing a liquid dipping process for material or material(s) (“material(s)”). More particularly although not solely the invention utilises an inverted flighted endless conveyor to lower and uplift the material(s) and to hold the material(s), if buoyant with respect to the liquid, to force the material(s) under the liquid prior to uplifting the material(s) therefrom.

### **BACKGROUND ART**

Rotary paddled systems have hitherto been utilised in a bath, the wall of which assumes a form similar to that of the locus of the distal part of the paddles of the rotary wheel.

The present invention appreciates however that such paddle wheel systems provide a transitory immersion only where by necessity (where there is to be both a gravity assisted loading zone and a gravity assisted discharge zone from the paddle wheel) there is a keeping of the liquid level below the rotational axis.

The present invention recognises a significant advantage can arise from the use of a flighted endless conveyor in that it has the prospect of providing a longer dwell time in liquid without reliance on a greater volume of liquid over that which might be used in a paddled wheel immersion system. Moreover the present invention recognises an advantage can occur at the discharge zone from such a conveyor when inverted owing to the prospect that such an endless conveyor can provide a discharge zone which is more positive in allowing the falling of already immersed materials therefrom.

It is therefore an object of the present invention to provide apparatus, methods, uses, etc. which will at least go some way to take one or more advantage from the use of a flighted endless conveyor for the purpose of material immersion in a liquid.

As used herein the term “liquid” includes any fluid which has a liquid component, i.e. it can include mixtures of liquids, solutions, suspensions, emulsions, suspo-emulsions, etc.

**DISCLOSURE OF INVENTION**

In one aspect the invention consists in **apparatus for immersing material or materials ("material(s)) in a bath**, [said material(s) being preferably buoyant with respect to liquid of the bath], said apparatus comprising or including

5 a bath or reservoir ("reservoir") containing or to contain said liquid,

a flighted endless conveyor that serially present flights to a loading zone where each flight serially flight receives thereon material(s) to be immersed in the liquid of the bath and later presents material(s) initially received by the preceding flight to a discharge zone from whence the material(s) leave the flight,

10 **wherein** the loading zone to discharge zone involves an initial flight supported lowering of the materials and thereafter a following flight uplifting of the material(s) and/or liquid in the bath until such time as the materials are supported by said following flight out of the liquid of the bath and carried at least in part thereby to the discharge zone.

The reservoir can have provision for flow through or replenishment.

15 Preferably the discharge zone involves a gravity supported cascading of the materials from said following flight.

Preferably each flight at least substantially completely occludes a passageway through the bath defined by the conveyor and the reservoir.

20 Preferably the locus of movement of the endless conveyor is that of an inverted conveyor preferably substantially in the form of an inverted "j", the loading zone being at a region beyond the crook of the inverted "j" down which the flights move substantially on a vertical locus prior to ascending on the opposite side of the stem of the "j" and then into the overhang zone of the inverted "j" at which there is the discharge zone.

25 Preferably in other forms banana or other type circuit type shapes are contemplated irrespective of whether or not there is a vertical or near vertical descending from the loading zone, irrespective of whether or not there is a vertical or near vertical ascending from the lower most zone and irrespective of whether or not there is any overhand (and irrespective of any concavity or not in the locus).

30 In yet a further aspect the present invention consists in the use of a (or an inverted) **flighted endless conveyor** for the purpose of immersing materials in a bath, e.g. of a dipping liquid.

Preferably the materials are buoyant in the liquid of the bath and an underside of flights of the conveyor lowers the material in the liquid at least after an initial contacting of the liquid by the materials, e.g. preferably they are lowered on the upper side of the flight preceding the underside of the following flight.

5 By way of example only such immersion can be of apple pieces, e.g. during a process as in PCT/NZ02/00168.

Preferably the bath conforms at least in part to those regions of the conveyor that are to low the materials to carry the materials through and uplift the materials from the liquid.

10 In yet a further aspect the present invention consists in **the use of apparatus** of any of the kinds in accordance with the present invention for the purpose of dipping vegetable and/or fruit material in an appropriate dipping solution.

In still a further aspect the present invention consists in **dipping apparatus** substantially as herein described with reference to any one or more of accompanying drawings.

15 In yet a further aspect the present invention consists in **a method of dipping materials** when performed substantially as herein described with reference to any one or more of the accompanying drawings or the description generally.

In yet a further aspect the present invention consists in **a method of treating vegetable and/or fruit materials** which comprises or includes immersing the materials in a treating liquid under the action of a flighted endless belt conveyor.

20 Preferably an underside of one flight contacts, during at least an initial part of the immersion process in a bath, at least some of the materials which prior to immersion were lowered on the upper side of the flight preceding said one flight.

The invention also consists in **materials** treated by a method or apparatus of the present invention.

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## BRIEF DESCRIPTION OF DRAWINGS

A preferred form of the present invention will now be described with reference to the accompanying drawing in which,

30 **Figure 1** is a side view of an inverted (an inverted J shaped locus) and flighted endless belt conveyor having an infeed loading zone for materials (such as apple slices) and having a

discharge zone which under gravity drops the materials into a like or, as shown, a conventional paddle wheel type immersion apparatus for a secondary immersion process, and

Figure 2 is a perspective diagram shown with the bath containment transparent (for ease of explanation) showing the inter-relationship of the components.

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## BEST MODE FOR CARRYING OUT THE INVENTION

In the preferred form of the present invention a bath 1 defined by liquid in the lower part, the reservoir, of a generally inverted "j" or banana shaped containment (both inner and outer walls) has descending there into a series of flights 3A, 3B, etc. carried by a motor/gearbox driven endless belt conveyor such that apple slices, onion slices or other materials may be fed into the encompassment of the bath 1 but above the liquid level shown as 5 so as to be supported on a flight 3A (on one side) prior to that moving downwardly below the liquid thereby floating the apple pieces on the liquid until such time as the following flight 3B (by its side facing flight 3A) forces the materials downwardly around the bottom 4 of the bath before uplifting the materials with the flight 3B to the discharge zone 6 from whence the immersed materials cascade into any subsequent collection or subsequent treatment apparatus.

The flights (e.g. 3A, 3B et al.) are preferably perforated slats (or a mesh or mesh including) to ensure the immersed product can freely drain back to the bath prior to discharge.

The belt itself need not be perforated but can be (e.g. a mesh).

As shown, by example, is a paddle wheel arrangement 7 for a subsequent treatment solution.

A process that might be utilised is an apple or other treatment regime substantially as disclosed in the aforementioned Patent Specification of HortResearch or which may be a treatment regime such as disclosed by various Mantrose Haueser Company patent (e.g. US 5,925,395 and 5,939,117).

As shown in the drawings an infeed conveyor 8 is provided to feed to the loading zone 9 between flights whilst the liquid level of the liquid 5 in the inverted 'j' shaped bath (both that shape for the inner and the outer walls so as to provide a better guide for the belt) is maintained reliant upon a dosage tank 10 feeding through a heat exchanger 11 communicating by a pump system 12 with the bath 1. As separate liquid can be provided in any subsequent treatment apparatus such as the paddle arrangement shown in 7.

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Persons skilled in the art will appreciate the speed control applicable (dependent on treatment needs) for the motor/gearbox 13 (e.g. providing variable speed drive to allow different immersion times) and for relativity with any previous and following processing the variations that exist for arrangements as aforesaid.

5        Materials by which the conveyor system and surrounds can be made are of any suitable material that can handle the stress of the environment and usage as well as provides such acceptability as is required for what are preferably food grade items. Envisaged therefore as suitable materials are food grade plastics materials (e.g. PVC, RMV, NITRILE, HDPE, etc.), food grade rubber or synthetic rubber materials, food grade or other metals (e.g. stainless steel)  
10 as well as for non-food and/or bath contacting surfaces any suitable acceptable structural or manufacturing material (e.g. mild steel, plastic, etc.).

The control systems and drives are of any acceptable kind and will be well known to persons skilled in the conveying art and/or food processing industries. .